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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art: 3679
Examiner: Aaron M. Dunwoody
Applicants: Loughrin et al
Serial No.: 09/943,685
Filed: August 30, 2001
For: **DRIVE SHAFT COUPLING**

14/ Appeal Brief
S/N
9-24-03

APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Director of the U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

RECEIVED
SEP 10 2003
GROUP 3600.

Dear Sir:

This is an appeal from the March 10, 2003 final rejection of Claims 1-4, 6-8, 10 and 11 of the above-identified application. Claims 5 and 9 are objected to by the Examiner. No claims have been allowed. A copy of the Examiner's Final Office Action dated March 10, 2003 is attached as Exhibit A.

Claims 1-4, 6-8, 10 and 11 are rejected under 35 U.S.C. Section 102(e) as being anticipated by Aota et al. The same claims are rejected under 35 U.S.C. Section 102(b) as being anticipated by Schremmer et al. Claims 5 and 9 are objected to and would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims. No claims have been cancelled. The claims on appeal are Claims 1-4, 6-8, 10 and 11 and are reproduced in Exhibit B.

The references cited by the Examiner, specifically Aota et al. and Schremmer et al. are attached as Exhibit C.

REAL PARTY IN INTEREST

GKN Walterscheid GmbH is the real party in interest, being the assignee of the present application.

RELATED APPEALS AND INTERFERENCES

To the best of Applicants' knowledge, no other appeals or interferences are pending which will directly affect or be directly affected by or have a bearing on the Board's decision in the present pending appeal.

STATUS OF THE CLAIMS

Claims 1-4, 6-8, 10 and 11 stand finally rejected (attached as Exhibit B). Claims 5 and 9 are objected to.

STATUS OF THE AMENDMENTS

The claims were amended June 5, 2003 in the response to the final rejection. The claims were entered by the Examiner in his Advisory Action dated June 26, 2003 (attached as Exhibit D). The claims are reproduced in Exhibit B.

SUMMARY OF THE INVENTION

The invention relates to a drive shaft assembly (1) for interconnecting a driving component of an agricultural machine in a driven component of an agricultural implement. The drive shaft assembly (1) includes a first shaft (16) and a second shaft (17) engaging the first shaft 16 for enabling torque transmission and relative axial sliding motion. See Figure 1. A joint component (6) of a universal joint (2) interconnects one of the first and second shafts (16) and

(17) to the agricultural driving and driven component. The joint component is both rotatable through a specific range of free rotation (see Figure 3) and is fixed from axial movement relative to one of the second shafts (see Figure 4). The agricultural driving component of the agricultural machine and agricultural driven component of agricultural implement. A copy of the application is attached as Exhibit E.

ISSUE

Applicant represents the following issues to review:

- 1) Whether or not claims 1-4, 6-8, 10 and 11 are unpatentable under 35 U.S.C. §102(e) over Aota et al.
- 2) Whether or not claims 1-4, 6-8, 10 and 11 are unpatentable under 35 U.S.C. §102(b) over Schremmer et al.

GROUPING OF THE CLAIMS

Claims 1-4, 6-8, 10 and 11 stand or fall together.

ARGUMENT

BACKGROUND OF THE INVENTION

The present invention relates to a drive shaft coupling for interconnecting a driving component and a driven component in agricultural machinery.

In many instances, a driving component is required to be operatively connected with a driven component for driving communication. Further, the interconnection must enable a degree of relative motion between the driving and driven components. For example, in many agricultural operations, a tractor is used to tow a secondary agricultural implement. Also, the tractor operatively drives the second agricultural implement. To achieve this, the tractor typically includes an output shaft (driving component) operatively interconnected to an input shaft (driven component) of the

secondary agricultural implement. The interconnection is typically achieved by a drive shaft disposed between the two components.

In almost all instances, the tractors are used for a variety of tasks. Accordingly, various types of secondary agricultural implements must be readily engageable with the tractor. Thus, connection and disconnection of the drive shaft assembly is required. Often, the output shaft of the tractor and the input shaft of the secondary agricultural implement are not sufficiently aligned and thus prohibit quick interconnection.

Thus, the present invention relates to a drive shaft coupling that includes a range of rotational motion, or free motion, to enable interconnection between the input and output shafts when they are not of exact rotational alignment. The drive shaft assembly includes a first shaft and a second shaft engaging the first shaft for enabling torque transmission and relative axial sliding motion. A joint component of a universal joint operatively interconnects one of the first and second shafts to one of the agricultural driving or driven components. The joint component is both rotatable through a specified range of free motion rotation and is fixed from axial movement relative to one of the second shaft, the agricultural driving component of the agricultural machine and the agricultural driven component of the agricultural implement. Neither Aota et al. or Schremmer et al. anticipate the present invention. Further, neither one would render the invention obvious to those skilled in the art.

It is respectfully submitted that the Examiner is misapplying the references.

The Aota et al. reference cited by the Examiner discloses an elastic shaft joint. The elastic shaft joint is in a steering mechanism of an automobile as shown in Figure 9 of the Aota et al. patent. The joint shuts off vibration transmission from a wheel to a steering wheel and allows a steering wheel operation to have an elastic play by utilizing the torsion of a damper. By definition,

an elastic play would always return the joint to its original position. Thus, the elastic joint of the Aota et al. reference always return the joint to its original position and does not provide for free motion.

The Court of Appeals for the Federal Circuit has recently stated:

A rejection of anticipation under Section 102 requires that each and every limitation of the claimed invention be disclosed in a single prior reference. (Cited omitted). In addition, the reference must be enabling and describe the Applicant's claimed invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. (Cited omitted). In re Paulson, 31 USPQ 2d. 1671 (Fed. Cir. 1994) at 1673.

The Aota et al. reference cited by the Examiner fails to meet the first step of the above test. The Aota et al . reference does not disclose a specified range of free motion rotation. Further, the Aota et al. reference clearly fails to disclose agricultural driving and driven components. Thus, the Aota et al. reference fails to meet the first step of the court's requirements set forth In re Paulson.

With respect to the second part of anticipation, the reference must describe the Applicant's invention sufficiently to have place a person of ordinary skill in the field of the invention in possession of it. Clearly this is not the case. The Aota et al. reference relates to an elastic shaft joint in a steering column. This clearly is unrelated to the drive train of an agricultural implement. Thus, the Aota et al. reference would not place a person of ordinary skill in the field of agricultural drive trains in possession of the present invention. Accordingly, the Aota et al. reference does not meet the standard set forth by the Federal Circuit.

With respect to Schremmer et al., Schremmer discloses a motor vehicle steering spindle which is designed to prevent the rotational play of the receiving tube in the shaft. See, Schremmer (U.S. Patent No. 5,672,111, col. 2, lines 30-44 and col. 3, lines 55-57). Thus, Schremmer et al.

teaches directly away from Applicants' claimed free motion rotation. Also, Schremmer et al. fails to disclose an agricultural driving and driven component.

With respect to the second part of the anticipation test, Schremmer et al. fails to sufficiently place a person of ordinary skill in the field of the invention in possession of it. Thus, nowhere does Schremmer et al. disclose or suggest that his application would be used in a drive train of an agricultural device. Schremmer et al. at best discloses the use of his invention in a steering spindle with a plug-in connection. Thus, the Schremmer et al. reference teaches away from the claimed invention.

Claims 1-4, 6-8, 10 and 11 stand or fall together. Accordingly, Applicants believe the above groupings to be proper.

CONCLUSION

Applicants respectfully submit that the Examiner has not proven that Aota et al. or Schremmer et al. have met the two prong test put forth by the Federal Circuit for an anticipation rejection. Further, the Schremmer et al. reference teaches away from Applicants' invention. Also, both Aota et al. and Schremmer et. disclose steering column joints which do not place one skilled in the art of agricultural drive train in possession of the present invention.

Accordingly, reversal of the final rejection of Claims 1-4, 6-8, 10 and 11 and allowance of the claims is respectfully requested.

Dated: September 2, 2003

P.O. Box 828
Bloomfield Hills, MI 48303
(248) 641-1600
Attorney Docket No. 6039-000293
Enclosures

Respectfully submitted,
HARNESS, DICKEY & RIECE, P.L.C.

BY:

W. R. Duke Taylor
Reg. No. 31,306
Attorneys for Applicants



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,685	08/30/2001	Terry Loughrin	6039-000293	1262

27572 7590 03/10/2003

HARNESS, DICKEY & PIERCE, P.L.C.
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[REDACTED] EXAMINER

DUNWOODY, AARON M

ART UNIT	PAPER NUMBER
3679	

DATE MAILED: 03/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

6039-000293

W.K.DT

RPM

Final OA

Due

Office Action Summary

	Application No.	Applicant(s)
	09/943,685	LOUGHIN ET AL.
	Examiner Aaron M Dunwoody	Art Unit 3679

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 02 January 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-4,6-8,10 and 11 is/are rejected.
- 7) Claim(s) 5 and 9 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on 02 January 2003 is: a) approved b) disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

- (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
- (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-4, 6-8, 10 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by US patent 6283867, Aota et al.

In regards to claim 1, in figures 9-12, Aota et al discloses a drive shaft assembly for interconnecting a driving component of an agricultural machine and a driven component of an agricultural implement, comprising a first shaft; a second shaft engaging the first shaft for enabling torque transmission and relative axial sliding motion therebetween; and a joint component of a universal joint operably interconnecting one of the first and second shafts to one of the agricultural driving and driven components, the joint component is both rotatable through a specified range of rotation and is fixed from axial movement relative to one of the second shaft, the agricultural driving component of the agricultural machine and the agricultural driven component of the agricultural implement.

In regards to claim 2, in figures 9-12, Aota et al discloses the joint component including axial grooves and the second shaft includes an end portion having radially extending axial teeth for engaging the grooves and thereby enabling the specified range of relative rotation.

In regards to claim 3, in figures 9-12, Aota et al discloses the grooves being formed within a bore of the joint component and the teeth extend outward from the end portion, whereby the end portion is received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 4, in figures 9-12, Aota et al discloses the grooves being formed in an outer circumferential surface of the joint component and the teeth extend radially inward from the end portion, whereby the joint component is partially received into the end portion for enabling engagement between the teeth and the grooves.

In regards to claim 6, in figures 9-12, Aota et al discloses the joint component including axial grooves and one of the driving and driven components includes radially extending axial teeth for engaging the grooves and thereby enabling the specified range of relative rotation.

In regards to claim 7, in figures 9-12, Aota et al discloses the grooves being formed within a bore of the joint component and the teeth extend radially outward from one of the driven and driving components, whereby one of the driven and driving components is received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 8, in figures 9-12, Aota et al discloses the grooves being formed along a stub end of the joint component and the teeth extend radially inward within a bore of one of the driven and driving components, whereby the stub end is partially received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 10, in figures 9-12, Aota et al discloses the joint component being a universal joint yoke.

In regards to claim 11, in figures 9-12, Aota et al discloses the second shaft including a stub end interconnected thereto for operably interconnecting the joint component and the second shaft.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 6-8, 10 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by US patent 5672111, Schremmer et al.

In regards to claim 1, in figures 1-4, Schremmer et al discloses a drive shaft assembly for interconnecting a driving component of an agricultural machine and a driven component of an agricultural implement, comprising a first shaft; a second shaft engaging the first shaft for enabling torque transmission and relative axial sliding motion therebetween; and a joint component of a universal joint operably interconnecting one of the first and second shafts to one of the agricultural driving and driven components, the joint component is both rotatable through a specified range of rotation and is fixed from axial movement relative to one of the second shaft, the agricultural driving of the

agricultural machine component and the agricultural driven component of the agricultural implement.

In regards to claim 2, in figures 1-4, Schremmer et al discloses the joint component including axial grooves and the second shaft includes an end portion having radially extending axial teeth for engaging the grooves and thereby enabling the specified range of relative rotation.

In regards to claim 3, in figures 1-4, Schremmer et al discloses the grooves being formed within a bore of the joint component and the teeth extend outward from the end portion, whereby the end portion is received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 4, in figures 1-4, Schremmer et al discloses the grooves being formed in an outer circumferential surface of the joint component and the teeth extend radially inward from the end portion, whereby the joint component is partially received into the end portion for enabling engagement between the teeth and the grooves.

In regards to claim 6, in figures 1-4, Schremmer et al discloses the joint component including axial grooves and one of the driving and driven components includes radially extending axial teeth for engaging the grooves and thereby enabling the specified range of relative rotation.

In regards to claim 7, in figures 1-4, Schremmer et al discloses the grooves being formed within a bore of the joint component and the teeth extend radially outward from one of the driven and driving components, whereby one of the driven and driving

components is received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 8, in figures 1-4, Schremmer et al discloses the grooves being formed along a stub end of the joint component and the teeth extend radially inward within a bore of one of the driven and driving components, whereby the stub end is partially received into the bore for enabling engagement between the teeth and the grooves.

In regards to claim 10, in figures 1-4, Schremmer et al discloses the joint component being a universal joint yoke.

In regards to claim 11, in figures 1-4, Schremmer et al discloses the second shaft including a stub end interconnected thereto for operably interconnecting the joint component and the second shaft.

Allowable Subject Matter

Claims 5 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments, filed 1/2/03, with respect to claim 1 have been fully considered and are not persuasive. The applicant argues:

The Aota reference neither discloses nor suggests the coupling of the Aola et al device with a tractor or an agricultural implement.

The examiner disagrees. Claims in a pending application should be given their broadest reasonable interpretation. *In re Pearson*, 181 USPQ 641 (CCPA 1974). So, implement can be defined as a device used in the performance of a task. Since, steering columns are generally known to reside in agricultural equipment by those having and not having skill in the art, then an agricultural implement can be defined as an agricultural device used in the performance of a task, such as turning a tractor's steering wheel connected to a steering column. Therefore, the Aola et al device meets the limitations of claim 1 of the instant application.

Applicant's arguments appear more limiting than the claims themselves. Applicant argues "free motion" but does not specifically claim free motion. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron M Dunwoody whose telephone number is (703) 306-3436. The examiner can normally be reached on Monday - Friday between 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne H Browne can be reached on (703) 308-1159. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9302 for regular communications and (703) 872-9327 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1113.

.amd
March 7, 2003



ERIC K. NICHOLSON
PRIMARY EXAMINER

CLAIMS ON APPEAL

1. A drive shaft assembly for interconnecting a driving component of an agricultural machine and a driven component of an agricultural implement, comprising:

 a first shaft;

 a second shaft engaging said first shaft for enabling torque transmission and relative axial sliding motion therebetween; and

 a joint component of a universal joint operably interconnecting one of said first and second shafts to one of the agricultural driving and driven components, said joint component is both rotatable through a specified range of free-motion rotation and is fixed from axial movement relative to one of said second shaft, the agricultural driving component of the agricultural machine and the agricultural driven component of the agricultural implement.

2. The drive shaft assembly of claim 1, wherein said joint component includes axial grooves and said second shaft includes an end portion having radially extending axial teeth for engaging said grooves and thereby enabling said specified range of relative rotation.

3. The drive shaft assembly of claim 2, wherein said grooves are formed within a bore of said joint component and said teeth extend outward from said

end portion, whereby said end portion is received into said bore for enabling engagement between said teeth and said grooves.

4. The drive shaft assembly of claim 2, wherein said grooves are formed in an outer circumferential surface of said joint component and said teeth extend radially inward from said end portion, whereby said joint component is partially received into said end portion for enabling engagement between said teeth and said grooves.

6. The drive shaft assembly of claim 1, wherein said joint component includes axial grooves and one of the driving and driven components includes radially extending axial teeth for engaging said grooves and thereby enabling said specified range of relative rotation.

7. The drive shaft assembly of claim 6, wherein said grooves are formed within a bore of said joint component and said teeth extend radially outward from one of the driven and driving components, whereby one of said driven and driving components is received into said bore for enabling engagement between said teeth and said grooves.

8. The drive shaft assembly of claim 6, wherein said grooves are formed along a stub end of said joint component and said teeth extend radially inward within a bore of one of the driven and driving components, whereby said stub end

is partially received into said bore for enabling engagement between said teeth and said grooves.

10. The drive shaft assembly of claim 1, wherein said joint component is a universal joint yoke.

11. The drive shaft assembly of claim 1, wherein said second shaft includes a stub end interconnected thereto for operably interconnecting said joint component and said second shaft.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,685	08/30/2001	Terry Loughrin	6039-000293	1262

27572 7590 06/26/2003

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[REDACTED] EXAMINER

DUNWOODY, AARON M

ART UNIT	PAPER NUMBER
	3679

DATE MAILED: 06/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

-Appell Brief Due 8/1/03
Advisory Action

	Application No.	Applicant(s)
	09/943,685	LOUGHIN ET AL.
Examiner	Art Unit	
Aaron M Dunwoody	3679	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 10 June 2003 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

- a) The period for reply expires 3 months from the mailing date of the final rejection.
- b) The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.
2. The proposed amendment(s) will not be entered because:
 - (a) they raise new issues that would require further consideration and/or search (see NOTE below);
 - (b) they raise the issue of new matter (see Note below);
 - (c) they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
 - (d) they present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: ____.

3. Applicant's reply has overcome the following rejection(s): _____.
4. Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
5. The a) affidavit, b) exhibit, or c) request for reconsideration has been considered but does NOT place the application in condition for allowance because: it fails to overcome the prior art rejections.
6. The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.
7. For purposes of Appeal, the proposed amendment(s) a) will not be entered or b) will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: _____.

Claim(s) objected to: 5 and 9.

Claim(s) rejected: 1-4, 6-8, 10 and 11.

Claim(s) withdrawn from consideration: _____.

8. The proposed drawing correction filed on _____ is a) approved or b) disapproved by the Examiner.

9. Note the attached Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____.

10. Other: _____.

LYNNE H. BROWNE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3620

DRIVE SHAFT COUPLING

FIELD AND BACKGROUND OF THE INVENTION

[0001] The invention is directed toward a drive shaft coupling including a rotational range of "free-motion" for interconnecting a driving component and a driven component.

[0002] In many instances, a driving component is required to be operably interconnected with a driven component for driving communication. Further, the interconnection must enable a degree of relative motion between the driving and the driven components. For example, in many agricultural operations a tractor is used to tow a secondary agricultural implement. Also, the tractor operably drives the secondary agricultural implement. To achieve this, the tractor typically includes an output shaft (i.e. a driving component) operably interconnected to an input shaft (i.e. driven component) of the secondary agricultural implement. The interconnection is typically achieved by a drive shaft disposed between the components.

[0003] In almost all instances, the tractor is used for a variety of tasks. Accordingly, various types of secondary agricultural implements must be readily engageable with the tractor. Thus, connection and disconnection of the drive shaft assembly is required. Often, the output shaft of the tractor and the input shaft of the secondary agricultural implement are not sufficiently aligned and thus prohibit quick interconnection therebetween. Thus, it is desirable to provide a drive shaft assembly that includes a range of rotational motion, or "free-motion"

to enable interconnection between the input and output shafts when they are out of exact rotational alignment.

[0004] To this end, it is known in the art to provide a telescoping drive shaft assembly including a rotational range of "free-motion" along the telescopic interconnection. Such a drive shaft assembly is illustrated in U.S. Patent Nos. 5,827,122 and 5,938,534, assigned to Neapco, Inc. The patents each provide a drive shaft assembly, which includes telescopically interconnectable first and second drive shaft halves. The telescopic interconnection further includes a tooth/groove arrangement. The arrangement enables a range of relative rotation between the first and second halves. Also, the arrangement concurrently provides relative axial motion.

[0005] The prior art methods detailed above retain certain disadvantages. Specifically, the telescoping interconnection of the drive shaft assembly preferably includes first and second shafts each having a lemon-shaped cross-section including a generally circular shape with diametrically opposed extended portions or ribs. In this manner, the ribs fix the first and second shafts for common rotation while enabling relative axial plunging. Such a cross-section, while preferable due to reduced manufacturing costs, is unable to properly function when including a "free-motion" function. A further disadvantage of the prior art methods is that the possibility does not exist to separate the telescoping and rotational functions. Such separation may be desirable for particular applications.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention provides a drive shaft assembly to interconnect a driving component and a driven component. The drive shaft assembly includes a first shaft and a second shaft. The second shaft engages the first shaft to enable torque transmission and relative axial sliding motion. A joint component operably interconnects one of the first and second shafts to one of the driving and driven components. The joint component is both rotatable, through a specified range of rotation, and is fixed from axial movement relative to one of the second shaft, the driving component and the driven component.

[0007] In this manner, the present invention segregates the plunging and "free-motion" functions to separate components of the drive shaft assembly. As such, alternative cross-sections, such as a lemon-shaped cross-section, are usable for enabling plunging of the drive shaft. A significant advantage of this is that such alternative cross-sections are less expensive to produce as a result of centering on the ribs. Further, separation of the plunging and "free-motion" functions enables any kind of plunging components known in the art to be implemented. Additionally, the "free-motion" function has no kinematic effect on the plunging function.

[0008] From the following detailed description, taken in conjunction with the drawings and subjoined claims, other objects and advantages of the present invention will become apparent to those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0010] Figure 1 is a partial cross sectional view of a drive shaft assembly in accordance with the principles of the present invention.

[0011] Figure 2 is a partial cross sectional view of a universal joint component coupled to a shaft of the drive shaft assembly in accordance with a first preferred embodiment of the present invention.

[0012] Figure 3 is a cross sectional view of the universal joint and shaft engagement along the line A-A of Figure 2.

[0013] Figure 4 is a cross sectional view of a shaft assembly portion along the line B-B of Figure 2.

[0014] Figure 5 is a partial cross sectional view of the universal joint component coupled to the shaft in accordance with a second preferred embodiment of the present invention.

[0015] Figure 6 is a cross sectional view of the universal joint and shaft engagement along the line C-C of Figure 5.

[0016] Figure 7 is a partial cross sectional view of a universal joint component coupled to a shaft of an external driven or driving component.

[0017] Figure 8 is a cross sectional view of the universal joint and shaft engagement along the line D-D of Figure 7.

[0018] Figure 9 is a partial cross sectional view of an alternative embodiment of a universal joint coupled to an external driven or driving component.

[0019] Figure 10 is a cross sectional view of the universal joint engagement along the line E-E of Figure 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] With reference to the figures, a drive shaft assembly 1 is shown. The drive shaft assembly 1 generally includes a first universal joint assembly 2, a telescoping shaft assembly 3 and a second universal joint assembly 4. The first universal joint assembly 2 includes first and second universal joint yokes 5,6 operably interconnected by a first cross or spider 7. Similarly, the second universal joint assembly 4 includes third and fourth universal joint yokes 8,9 operably interconnected by a second cross or spider 10. Generally, the first and second universal joints 2,4 enable the drive shaft assembly 1 to be somewhat articulable for interconnecting a driving component (not shown) and a driven component (not shown) that require a degree of independent movement therebetween. Although the present embodiment describes first and second universal joints 2,4, it will be appreciated that the first and second universal joints 2,4 may be substituted for other joint types known in the art, such as constant velocity joints.

[0021] A protective cover 11 is further provided and completely surrounds the drive shaft assembly 1. The protective cover 11 includes first and

second tubes 12, 13 telescopically engaged with one another. A first flexible cover 14 is disposed about the first universal joint 2. A second flexible cover 15 is disposed about the second universal joint 4. The first flexible cover 14 is attachable to either the driven or the driving component. The second flexible cover 15 is attachable to the other of the driven and the driving component. In this manner, the protective cover 11 is fixed from rotation relative to the driven and driving components. The drive shaft assembly 1 rotates within the protective cover.

[0022] The telescoping shaft assembly 3 includes a first shaft 16 slidably disposed within a second shaft 17. The first shaft 16 is operably interconnected with the second yoke 6 of the first universal joint 2. The second shaft 17 is interconnected with the third yoke 8 of the second universal joint 4. As best seen in Fig. 4, the first and second shafts 16,17 each include a cross-section having a circular shape with diametrically opposed extended portions or ribs 16',17', respectively. The first and second shafts 16,17 slidably engage one another with the first shaft sliding into a bore 20 of the second shaft 17, whereby the ribs 16' slidably engage the ribs 17'. In this manner, the first and second shafts 16,17 are fixed for rotational motion with one another. The first and second shafts 16, 17 enable relative axial motion, or plunging, along a longitudinal axis X. This cross-section, which enables the plunging interconnection, is preferable since it is a less expensive option to produce the first and second drive shafts 16,17 than prior art methods, which include sliding spline engagements.

[0023] Although the present invention describes a rib interconnection to provide a telescoping function, it is anticipated that a spline engagement between the first and second shafts 16,17 may be optionally implemented to provide this function.

[0024] With particular reference to Figs. 2 and 3, a first preferred embodiment of the interconnection between the first shaft 16 and the first universal joint 2 will be described in detail. In accordance with the first preferred embodiment, the first shaft 16 is provided as a tube having a bore 23. A stub shaft 24 interconnects the first shaft 16 and the second yoke 6. A weld 25 is included to fixedly interconnect the stub shaft 24 and the first shaft 16. The stub shaft 24 includes a first end 26. The first end 26 has a reduced diameter which is disposed within the bore 23 of the first shaft 16. A second end 27 of the shaft 24, which has a larger diameter, is operably disposed within a bore 28 of the second yoke 6.

[0025] The bore 28 of the second yoke 6 includes a series of axially running grooves 29 and the second end 27 of the stub shaft 24 includes a series of radially extending, axial teeth 30. The second end 27 of the stub shaft 24 is received into the bore 28 of the second yoke 6. The teeth 30, respectively, align with the grooves 29. As best seen in Fig. 3, the grooves 29 are generally of a larger width than the width of the teeth 30. As a result, a range of relative rotational motion, or "free-motion" is provided between the second yoke 6 and the stub shaft 24. The amount of "free-motion" is provided as the angle A.

[0026] Although the second yoke 6 and stub shaft 24 are able to rotate relative to one another, within the provided range, they are fixed from relative axial motion. Accordingly, a first ring 31 is disposed about an end 32 of the stub shaft 24. A second ring 33 is disposed within a groove 34 of the stub shaft 24 to hold the first ring 31 against a face 35 of the stub shaft 24. In this manner, the second yoke 6 is fixed from axial movement between the first ring 31 and a washer 36 disposed about the first shaft 16.

[0027] With particular reference to Figs. 5 and 6, a second preferred embodiment of the interconnection between the first shaft 16 and the first universal joint 2 will be described in detail. In accordance with the second preferred embodiment, the second yoke 6 of the first universal joint 2 includes a stub end 37. The stub end 37 is received into the bore 20 of the first shaft 16. The bore 20 of the first shaft 16 includes a series of axially running grooves 38. The stub end 37 of the second yoke 6 includes a series of radially extending, axial teeth 39. The stub end 37 is received into the bore 20 of the first shaft 16. The teeth 39 respectively align with the grooves 38. As best seen in Fig. 5, the grooves 38 are generally of a larger width than the width of the teeth 39. As a result, a range of relative rotational motion, or "free-motion", is provided between the second yoke 6 and the first shaft 16. The amount of "free-motion" is provided as the angle A.

[0028] Again, the second yoke 6 and the first shaft 16 are fixed from relative axial motion. Accordingly, a ring 40 is disposed within a groove 41 of the stub end 37 and a groove 42 of the first shaft 16. The ring 40 seats within the

grooves 41,42 to sufficiently interconnect the stub end 27 and the first shaft 16. Disconnection of the stub end 27 and the first shaft may only be realized through the application of a high axial load. Disconnection is achieved when the load is applied beyond maximum telescoping action of the telescoping shaft assembly 3.

[0029] It is further anticipated that the "free-motion" interconnection can be provided at any one of several locations along the drive shaft assembly 1, as the drive shaft assembly 1 interconnects the driving and driven components. With particular reference to Figs. 7 and 8, the "free-motion" interconnection is included between one of the first and second universal joints 2,4 and one of the driving or driven components. More specifically, the yoke depicted in Fig. 7 is either the second yoke 6 of the first universal joint 2 or the fourth yoke 9 of the second universal joint 4. Further depicted is a stub shaft 44 which extends from and operably interconnects with a component 43. The component 43 is either the driving component or the driven component. The yoke 6,9 includes a bore 45 with a series of axially running grooves 46. The stub shaft 44 includes a series of radially extending, axial teeth 47. The stub shaft 44 is received into the bore 45 of the yoke 6,9. The teeth 47 respectively align with the grooves 46. As best seen in Fig. 8, the grooves 46 are generally of a larger width than the width of the teeth 47. As a result, a range of relative rotational motion, or "free-motion" is provided between the yoke 6,9 and the stub shaft 44. The amount of "free-motion" is provided as the angle A.

[0030] Similarly as described above, the yoke 6,9 and the stub shaft 44 are fixed from relative axial movement. Accordingly, a washer 48 and bolt 49

are provided. The washer 48 is bolted against an end face 50 of the stub shaft 44 by the bolt 49. The washer 48 is of a larger diameter than the stub shaft 44. The washer 48 seats within a recess 51 of the bore 45 of the yoke 6,8, against a first stop face 52. A stop ring 53 seats within a groove 54 of the bore 45. The stop ring 53 provides a second stop face 55. Thus, the washer 48 is fixed from axial movement between the first and second stop faces 52,55. This prohibits axial movement of the yoke 6,8 relative to the stub shaft 44.

[0031] An alternative embodiment of the "free-motion" interconnection between one of the first and second universal joints 2,4 and one of the driving or driven components is depicted in Figs. 9 and 10. The yoke 6,9 includes a stub end 56 extending from and operably interconnected with the component 43. The component 43 includes a bore 57. The bore 57 has a series of axially running grooves 58. The stub end 56 includes a series of radially extending, axial teeth 59. The stub end 56 is received into the bore 57. The teeth 59 respectively align with the grooves 58. As best seen in Fig. 10, the grooves 58 are generally of a larger width than the width of the teeth 59. As a result, a range of relative rotational motion, or "free-motion" is provided between the stub end 56 and the component 43. The amount of "free-motion" is provided as the angle A.

[0032] It should also be noted that the "free-motion" mechanism of the present invention may include a varying number of teeth and groove combinations. For example, as depicted in the Figures six teeth/grooves are implemented. However, this number may vary as a design may require.

[0033] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A drive shaft assembly for interconnecting a driving component and a driven component, comprising:

a first shaft;

a second shaft engaging said first shaft for enabling torque transmission and relative axial sliding motion therebetween; and

a joint component of a universal joint operably interconnecting one of said first and second shafts to one of the driving and driven components, said joint component is both rotatable through a specified range of rotation and is fixed from axial movement relative to one of said second shaft, the driving component and the driven component.

2. The drive shaft assembly of claim 1, wherein said joint component includes axial grooves and said second shaft includes an end portion having radially extending axial teeth for engaging said grooves and thereby enabling said specified range of relative rotation.

3. The drive shaft assembly of claim 2, wherein said grooves are formed within a bore of said joint component and said teeth extend outward from said end portion, whereby said end portion is received into said bore for enabling engagement between said teeth and said grooves.

4. The drive shaft assembly of claim 2, wherein said grooves are formed in an outer circumferential surface of said joint component and said teeth extend radially inward from said end portion, whereby said joint component is partially received into said end portion for enabling engagement between said teeth and said grooves.

5. The drive shaft assembly of claim 2, further comprising a ring engaged with a ring groove of one of said joint component and said second shaft for fixing said joint component and said second shaft from relative axial motion therebetween.

6. The drive shaft assembly of claim 1, wherein said joint component includes axial grooves and one of the driving and driven components includes radially extending axial teeth for engaging said grooves and thereby enabling said specified range of relative rotation.

7. The drive shaft assembly of claim 6, wherein said grooves are formed within a bore of said joint component and said teeth extend radially outward from one of the driven and driving components, whereby one of said driven and driving components is received into said bore for enabling engagement between said teeth and said grooves.

8. The drive shaft assembly of claim 6, wherein said grooves are formed along a stub end of said joint component and said teeth extend radially inward within a bore of one of the driven and driving components, whereby said stub end is partially received into said bore for enabling engagement between said teeth and said grooves.

9. The drive shaft assembly of claim 6, further comprising a ring engaged with a groove of one of said joint component, the driven component and the driving component for fixing said joint component and one of the driven component and driving component from relative axial movement therebetween.

10. The drive shaft assembly of claim 1, wherein said joint component is a universal joint yoke.

11. The drive shaft assembly of claim 1, wherein said second shaft includes a stub end interconnected thereto for operably interconnecting said joint component and said second shaft.

ABSTRACT OF THE DISCLOSURE

A drive shaft assembly to interconnect a driving component and a driven component has a first shaft and a second shaft operably engaged with the first shaft to enable torque transmission and relative axial sliding motion. A joint component operably interconnects one of the first and second shafts to one of the driving and/or driven components. The joint component is rotatable through a specified range of rotation, or "free-motion". The joint component is axially fixed relative to one of the second shaft, driving component and/or the driven component.



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HDP/SB/21 based on PTO/SB/21 (08-00)

AF 3679 #

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

		Application Number	09/943,685
		Filing Date	August 30, 2001
		First Named Inventor	Loughrin et al
		Group Art Unit	3679
		Examiner Name	Aaron M. Dunwoody
Total Number of Pages in This Submission		Attorney Docket Number	6039-000293

ENCLOSURES (check all that apply)

<input checked="" type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Assignment Papers (for an Application)	<input type="checkbox"/> After Allowance Communication to Group
<input checked="" type="checkbox"/> Fee Attached	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
<input type="checkbox"/> Amendment / Response	<input type="checkbox"/> Licensing-related Papers	<input checked="" type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
<input type="checkbox"/> After Final	<input type="checkbox"/> Petition	<input type="checkbox"/> Proprietary Information
<input type="checkbox"/> Affidavits/declaration(s)	<input type="checkbox"/> Petition to Convert to a Provisional Application	<input type="checkbox"/> Status Letter
<input checked="" type="checkbox"/> Extension of Time Request	<input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address	<input checked="" type="checkbox"/> Other Enclosure(s) (please identify below):
<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	Petition for Extension of Time
<input type="checkbox"/> Information Disclosure Statement	<input type="checkbox"/> Request for Refund	SEP 10 2003
<input type="checkbox"/> Certified Copy of Priority Document(s)	<input type="checkbox"/> CD, Number of CD(s) _____	GROUP 3600
<input type="checkbox"/> Response to Missing Parts/ Incomplete Application	Remarks	The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0250. A duplicate copy of this sheet is enclosed.
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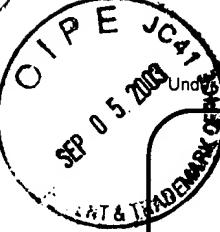
SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Harness, Dickey & Pierce, P.L.C.	Attorney Name W. R. Duke Taylor	Reg. No. 31,306
Signature			
Date	September 2, 2003		

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Signature		Date	September 2, 2003



FEE TRANSMITTAL for FY 2003

Patent fees are subject to annual revision.

 Applicant claims small entity status. See 37 CFR 1.27TOTAL AMOUNT OF PAYMENT (\$)
430

Complete if Known	
Application Number	09/943,685
Filing Date	August 30, 2001
First Named Inventor	Loughrin et al
Examiner Name	Aaron M. Dunwoody
Group / Art Unit	3679
Attorney Docket No.	6039-000293

METHOD OF PAYMENT (check all that apply)

 Check Credit card Money Other None
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 Deposit Account:Deposit
Account
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Deposit
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Name

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FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	110
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1401	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	320
1403	280	2403	140	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - undeclinable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or design)	
1502	470	2502	235	Design issuance	
1503	630	2503	315	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	2809	375	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

SUBTOTAL (1) (\$)
0

2. EXTRA CLAIM FEES

	Extra Claims	Fee from below	Fee Paid
Total Claims	-20 ** = 0	X 0 = 0	
Independent Claims	-3 ** = 0	X 0 = 0	
Multiple Dependent		X 0 = 0	

Large Entity Small Entity

Fee Code	Fee (\$)	Fee Code	Fee (\$)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$)
0

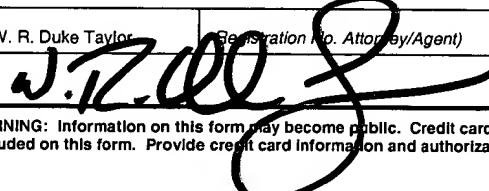
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Signature				Date	September 2, 2003

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